

EXAMINERS' REPORT

June 2025 examinations

Subject F102 — *Life Insurance* Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principal Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

QUESTION 1

i. Determining the basis:

- Assumptions will be needed for interest, expenses, expense inflation, mortality and possibly tax.
- Interest:
 - This will be the most important assumption;
 - Particularly at early durations, where a small change in the interest rate assumption will have a significant impact on the policy value.
 - Assets backing the liabilities are likely to be invested in fixed-interest investments (if available), matching the liabilities by term.
 - Therefore a weighted average redemption yield may be suitable for a best estimate assumption.
- Expenses:
 - The company's most recent expense investigation will indicate the best estimate of renewal expenses.
 - An allowance is also required for:
 - renewal commission; and
 - the costs associated with surrendering the policy.
- Inflation:
 - The assumption should be consistent with the investment return assumption.
 - The real-return on index-linked government bonds might indicate the margin below the full (nominal) interest rate assumption.
- Mortality:
 - As this is a new product,
 - The mortality experience from a similar product sold by the company could be used.
 - External sources of mortality could also be considered e.g. industry mortality tables or tables from reinsurers.
 - However, adjustments may be required to reflect any differences in underwriting practice, target market etc.
 - The assumption should reflect the future expected mortality experience of those policyholders that surrender.
 - This is possibly lighter than the mortality experience of those who do not surrender, as policyholders that are concerned by the disease are unlikely to discontinue their life cover.
 - In practice it may be difficult to prove this difference in mortality experience (as the mortality experience of those that surrender is not available to the insurer).
 - The company could:
 - make explicit allowance for lighter mortality; or
 - use select mortality (although the nature of selection here is not the same as underlying standard mortality tables).

ii. General:

- The company will make a retained profit on the policy equal to the difference between the asset share and the surrender value (SV) paid.

a. Decrease in long-term interest rates:

- At later durations, when asset shares are positive, a decrease in interest rates is likely to lead to an increase in asset values backing the asset shares (e.g. long-term bonds), and therefore an increase in the positive asset shares.
 - If the company's investment strategy includes a significant cash holding, then there will only be a limited effect on the asset shares.
- Assuming that the company can change surrender values in terms of the contract conditions, at these later durations the best estimate assumption for the interest rate will be reduced, leading to an increase in surrender values.
 - The increase is due to the expected present value of benefits being more sensitive to changes in interest rates (given the longer discounted mean term of these cashflows), than the expected present value of premiums.
- If assets were:
 - matched to the expected future liability cashflows, there may not be a (material) change in the retained profit on surrender.
 - not matched, then there may be a profit or loss depending on the relative change in asset share values and surrender values.
- At early durations, the change in the long-term interest rates is unlikely to affect the retained profit.
 - The SV is not impacted as it is defined in terms of premiums paid.
 - The "investment return" assumption on negative asset shares can be interpreted as the cost of funding.
 - If, the cost of funding is unchanged then, the negative asset share will not change.
 - If, however, it is linked to a reduction in the long-term interest rates then asset shares may become less negative and as a result losses will decrease.

b. Increase in mortality experience:

- If there is only an increase in mortality in the medium to longer-term, then there will be no immediate impact on asset shares.
- However, asset shares are likely to be smaller (or more negative) as mortality experience worsens, leading to higher claim payments being deducted from the asset shares.
 - There may also be additional claim expenses being incurred due to increased claim volumes (e.g. additional claim assessors must be appointed).
 - This will depend on the extent to which this disease affects the insured population.
 - It also assumes that the premium rates cannot be reviewed.

- The company may decide not to change the mortality assumption used in the calculation of policy values, as only those policyholders that are more confident that they will not be exposed to the disease are likely to lapse.
- The lower (or more negative) asset share will mean a decrease in retained profits (or losses) at both early durations (whilst the surrender value is based on a return of premiums); and later durations.
- If the company increases the mortality assumption used to calculate the SVs, this will lead to an increase in surrender values based on the policy value, which will further reduce profits on surrender.

The average mark for this question was very low.

Part (i) was bookwork and candidates who were well prepared did well. Many candidates did not read the question carefully, and assumed the question asked for the considerations when setting surrender values (which it did not). Although that may have been a frequently asked question in past papers, it was not the question asked here.

Answers to part (ii) were generally very poor. The impact of a change in interest rates on (positive) asset shares is discussed in the course material and can therefore be assumed to be bookwork. Many candidates failed to recognise that lower investment returns and higher mortality assumptions both drive up the prospective policy value of whole life products.

QUESTION 2

i. Advantages to applicants:

- The processing of applications will be faster due to limited underwriting and a simpler product. Therefore, decisions could be taken within a few minutes or hours.
- Applicants do not need to undergo medical examinations, making the process less invasive.
- The filling in of applications is simpler and more convenient, with fewer health-related questions.
- These products are more accessible to individuals who might be declined for traditional life insurance due to health issues.
- Reduced underwriting requirements can lower administrative costs for insurers, potentially leading to more competitive premiums.

ii. Risks to the insurer:

- The underwriting decision is based on less information (and different information to existing policies), so there is an increased risk of premium rates not accurately reflecting the true risk.
 - For example, if the simplified questions fail to identify, or underestimate, particular risks, there is a chance that the company can be selected against (i.e. rates too low).
- If mortality experience is worse than priced for, the product could be loss-making (and ultimately threaten the solvency position of the insurer).
- Insurers may charge higher premiums to offset the increased risk which could reduce sales (i.e. rates too high).
- Coverage amounts are likely to be lower compared to fully underwritten policies and therefore the target market might be different to its current policyholders, further increasing the risk of inappropriate pricing.
- Risk of misrepresentation: without medical exams, there is a higher risk of applicants misrepresenting their health status, which can lead to claim disputes.
- Reputational risk: if lots of claims are being declined due to non-disclosure then there is a chance of reputational damage for not paying claims.

iii. Possible reasons:

- Random fluctuations (particularly if the book is still small).
- Misrepresentation e.g. smokers declaring themselves as non-smokers.
- Anti-selection worse than anticipated, for example:
 - if questions not well chosen to indicate relevant risks; or
 - competitors underwrite more effectively.
- Salesforce could encourage anti-selection to boost sales.
- Business mix may have been different to expected.
 - This is a problem if the pricing basis had allowed for cross-subsidies.
- Product may have appealed more to a market with worse mortality.
 - This would make existing data from old product less relevant than expected.

Concerns:

- Poor experience results in smaller than anticipated profits or even losses
- Could threaten company solvency and impact shareholders' net worth
- If the product is reinsured, poor experience will lead to the reinsurance premiums increasing, further affecting the bottom line.
- If business is still being sold on loss-making terms, the consequences could get worse.

iv. Actions by the company could include:

- Carry out a detailed study of experience to date, particularly as it relates to the responses to the underwriting questions.
- Train underwriters to make better decisions based on existing questions.
 - E.g. reject / offer special terms for some question responses that are currently being accepted on standard rates.
- Update underwriting questions to be more useful:
 - Ask reinsurers to review underwriting questions.
 - Apply behavioural economics to ensure questions obtain desired outcomes.
 - Compare questions with those used by competitors to identify if there are opportunities for anti-selection.
- Review existing policyholders i.e. carry out some post issue sampling to determine if there is any misrepresentation on current policies e.g. smoking status.
- Change product design.
 - Reduce maximum sums assured to minimize exposure.
 - Include waiting periods for claims from natural causes.
- Reintroduce limited additional underwriting on the product.
- Stop selling this product.
 - Alternatively, sell only to specific groups who are expected to be generally healthy e.g. members of running clubs.
- Sales staff and channels.
 - Upskill sales staff to ensure the sales process reduces the risks of mis-selling and mis-representation.
 - The company could change its target market or distribution channels.

If “experience” is taken as being relative to the pricing basis:

- Update the pricing basis:
 - Identify where mortality rates are out of line with the pricing basis.
 - Ask reinsurers to review the pricing basis to determine if any improvements can be made.
 - Compare premiums to competitors’ premiums to identify if there are chances for anti-selection.
 - Add additional margins for uncertainty into the pricing basis.

The question was reasonably well handled on the whole.

There were some odd things (in the context of the question asked) that were surprisingly common in the responses, for example: the idea that there would be selective lapses (instead of prospective policyholders just choosing the competitor products upfront); calculation errors being the first reason given to explain experience being different to pricing assumptions; the assumption that age and gender would be ignored in the simplified underwriting; and suggesting capping the sum assured, which was already stated in the question.

QUESTION 3

- i. The cost of a mortality option is the value of the excess of the premium that should, in the light of full underwriting information, have been charged for the additional assurance over the normal premium rate that is charged.

The total expected additional costs of an option depend on the health status of those who choose to exercise the option, and the proportion of lives that choose to exercise the option, namely:

$$(\text{proportion of lives exercising option}) \times (\text{average health of lives exercising option})$$

- ii. Key factors to consider in pricing the mortality option:

- Future mortality:
 - The mortality rates of policyholders who take up the option will impact the cost of the option.
 - Consider the underlying mortality for the group members and any differences between the group and individual lives
 - Differences are likely as group schemes typically have less stringent underwriting.
 - Consider how mortality rates may vary between smokers and non-smokers, as identified by the test to be used.
- Anti-selection:
 - Members in poor health, who are less likely to pass standard underwriting, may be more likely to opt to take out the option.
 - Healthier members may be less likely to see the need to continue life cover.
 - Consider the expected mortality differential between those who take up the option and the broader insured population taking out individual policies.
- Take-up rate of the option:
 - It will be important to consider the take-up rate for the option, as this will impact its cost.
 - A low take-up rate could exacerbate anti-selection.
 - The company may wish to encourage take-up from certain groups of low-risk individuals.
- Pricing margins:
 - The extent of margins, to account for uncertainty in future experience relative to pricing assumptions, should be considered.
- Expenses:
 - Administrative costs associated with converting group policies to individual policies will need to be considered,
 - Underwriting costs will also need to be considered.
 - The ongoing option maintenance costs (monitoring experience etc) will also need to be considered.
- Underwriting:
 - Consider how well the inclusion of the smoker test could segment the pool into different risk categories, affecting overall mortality assumptions and pricing.
 - The smoker test would assist in reducing the anti-selection risk.

- Experience data:
 - Consider the extent to which past data (if available) from similar options on the insurer's existing business could be used to inform the assumptions, considering the specific demographics and risk profiles of the group scheme.
- Regulation:
 - Consider any regulatory requirements related to non-discrimination and fairness in pricing.
 - This may be particularly relevant in relation to smokers versus. non-smokers.
- Competition:
 - Consider the pricing strategies of competitors offering similar options and ensure that the pricing remains competitive while adequately covering the risks.
- Take into account additional reserves to be held before and after the exercise of the option.
- Extent of risk mitigation:
 - The extent of risk mitigation, e.g. reinsurance, should be considered when pricing as this impacts the risk faced by the company.

iii. Anti-selection risk:

- Higher-risk individuals (e.g., those with pre-existing health conditions) are more likely to take up the option, knowing they can secure cover without full underwriting.
 - The impact is likely to be exacerbated if there is a low take-up rate of the option.
- If the definition of a smoker is not clear (or testing inadequate), smokers might be able to effect the individual policy (as a non-smoker).

iv. Mitigation of anti-selection risk:

- Introduce additional underwriting:
 - E.g. a short medical questionnaire or tele-underwriting.
 - This would aim to prevent those who should not qualify from obtaining the cover.
- Impose a waiting period before the option can be exercised.
 - This should remove the worst cases of anti-selection.
- Restrict eligibility for the option:
 - Limit to groups likely to be in better health.
 - E.g. those below a certain age.
 - Exclude certain conditions such as cancer or diabetes – although this could affect the marketability of the option.
 - Require those taking up the option to be actively at work – not resigned due to ill-health.
- Increase the price of the option – paid through the group life scheme – to account for the anti-selection risk.
- Restrict the amount of cover available on exercising the option to twice salary or some fixed amount

- Apply a free cover limit – if sum assured is above this, then underwriting should be required for the extra cover.
- Monitor the claims experience of those taking up the option.
 - Adjust future pricing or eligibility criteria based on observed experience.
- Clearly define the definition of smoking, e.g. if you smoked at all during the past 24 months.
- Market the option to policyholders who are expected to be healthiest.
 - E.g. those below a certain age.
 - Offering the option digitally only could also achieve this.
 - However, consider TCF in doing so.

Overall the question was reasonably answered. However, few candidates made enough points in all parts of the question.

In part (i) many candidates were confused between the option price (option premium) and the cost of an option.

In part (ii) some candidates spent a lot of time listing all generic factors to consider when pricing contracts without making answers applicable to the information given in the question.

In part (iii) many candidates, unrealistically, said people will join the employer with the plan to leave soon afterwards to be able to take up the option. Candidates also focused on potential over-insurance, which is a different issue than anti-selection. Many candidates said that people could stop smoking before leaving the scheme and take up smoking again after the option was taken up. This is non-disclosure/fraud, not anti-selection.

Part (iv) was generally well answered when candidates made their answers applicable to the question. Some made impractical suggestions such as continuously monitoring smoker status in the group scheme or after taking up the option.

QUESTION 4

i. Policyholders' needs:

- The deferred annuity provides a monthly savings mechanism.
- The annuity provides a guaranteed income stream after the deferred period, ensuring financial stability during retirement.
 - Also, it does not require decisions or management of funds during retirement.
- The annuity helps policyholders manage the longevity risk of outliving their savings by providing lifetime payments.
- Policyholders are protected from market volatility and investment risks, as the insurer bears the investment risk associated with generating the returns required to meet annuity payments.
- The impaired life annuity offers higher payments for those in poor health, providing additional financial support when it is needed most.

- If the annuity increases once in payment it should help offset the effects of inflation.
- Annuities can be structured to provide for beneficiaries (for example in the case of joint life annuities), ensuring that dependents are protected if the policyholder dies.
- Should the annuity provide a death benefit (for example a return of premiums paid to date) during the deferred period, beneficiaries would receive additional protection.

Company's needs:

- Deferred annuities provide a predictable and steady stream of premium income during the deferred period, improving the company's cash flow and financial planning.
- Offering this product may allow the company to differentiate its products from those of competitors
 - This could lead to increased new business.
- By offering annuities the company is able to reduce/diversify their risk exposure to mortality.
 - This is because it creates a hedge between longevity and mortality risk with mortality risk emanating from its assurance book (if they have a material one).
- Providing flexible benefits, such as the impaired life annuity, helps retain customers by meeting their evolving needs, reducing policy lapses and surrenders.
- By accurately pricing the annuities and managing the associated risks, the company can achieve profitability while providing valuable services to policyholders.
- The impaired life annuity option encourages the company to develop robust data collection and analytics capabilities, improving overall underwriting and pricing strategies.

ii. Key risks:

- Insufficient data:
 - The company may not have sufficient data on future mortality, take-up rate, expenses, etc. to predict future experience.
 - This will impact the suitability of the level of enhancement offered, and ability to price for it.
 - Mitigation: Discuss with a reinsurer.
 - Mitigation: Consider market rates for impaired life annuities.
- Experience is different to that assumed when setting the level of enhancement.
 - This could result in losses for the company.
 - Mitigation: Build in margins and carry out extensive modelling.
- Anti-selection:
 - Policyholders with deteriorating health are more likely to take out this product than a normal annuity, knowing there is the possibility of an enhanced annuity after the deferred period.
 - This can result in more than expected individuals being eligible for the enhanced annuity.

- Mitigation: Implement stringent underwriting criteria on conversion to the annuity
- Mitigation: Ongoing monitoring of the mortality of the enhanced annuity experience with updates to reserving, pricing and underwriting, if required.
- Uncertainty in mortality rates:
 - Predicting future mortality rates for impaired lives is challenging due to variability in health conditions and medical advancements.
 - Incorrect assumptions can lead to significant errors in setting suitable annuity enhancements.
 - Mitigation: Use a range of scenarios in mortality assumptions and update them regularly based on the latest medical research and industry trends ensuring that the pricing basis is regularly updated.
 - Mitigation: Employ stress testing to understand the impact of various mortality assumptions on profitability.
- Uncertainty of the take-up rate of the impaired life annuity:
 - Uncertainty around how many policyholders will qualify for the impaired life annuity can affect the accuracy of experience modelling. The actual uptake rate may differ from initial estimates, impacting the financial projections and expenses incurred.
 - Mitigation: Underwrite strictly starting with lower cost options before requiring expensive medical procedures.
 - Mitigation: Analyse historical data and industry trends to estimate likely take-up rates.
 - Mitigation: Implement flexible models that can adjust assumptions based on emerging experience and policyholder behaviour.
- Impact of medical advances:
 - Future medical advancements could significantly alter mortality rates, especially for impaired lives, making it difficult to model future experience accurately.
 - New treatments and healthcare improvements can extend the life expectancy of impaired lives.
 - Mitigation: Maintain a robust monitoring system for medical advancements and incorporate a margin for adverse deviations to account for unexpected changes.
 - Mitigation: Regularly review and update the mortality assumptions (for both reserving and pricing) to reflect the latest medical developments.
- Underwriting and admin expenses higher than expected:
 - Many more people than expected may apply for the enhanced annuity, resulting in higher underwriting costs than expected.
 - There is no disincentive to stop everyone applying for the enhancement.
 - This would also result in higher admin costs than expected in processing the requests.
 - Expense inflation may be higher than expected
 - Underwriting expenses are linked to medical inflation which is generally higher than “general” inflation
 - Mitigation: Build in margins
 - Mitigation: Monitor experience.

- Sales of the product lower than expected:
 - The product may appear complex.
 - This complexity may be experienced by the distribution channel as well as potential policyholders.
 - Mitigation: Provide clear product literature.

In general this question was poorly answered, with few candidates performing consistently well in both question parts.

Part (i) was generally reasonably answered, although many candidates gave a list of things that could be done by the policyholder with the income, which did not receive marks. Very few candidates mentioned the variations, such as increasing or joint life annuities.

In part (ii) few candidates considered the limited data and potential changes to future mortality experience and explored this sufficiently. Many candidates produced a generic prepared “risk list” without considering the key risks at all which did not score well. Candidates who gave a mitigation for each risk, rather than a list of risks and a separate list of mitigations, generally produced better answers.

QUESTION 5

i Features of the model:

- The model will show projections of future cashflows arising on this portfolio of business.
 - The key cashflows will be premiums, disability income payments and expenses (admin and ongoing disability assessment).
 - Reinsurance cash flows (premiums and recoveries) should also be catered for.
- The model must consider two distinct phases, being active premium-paying policyholders who face a future risk of claim inception, and a claim-in-payment liability for policyholders who have already become disabled.
- The projections will need to take into account lapses, mortality, claim inception and recovery rates.
 - A multi-state modelling approach, with transition probabilities for movements between states, could be used for the projections.
- The projected cashflows must be discounted at an appropriate discount rate that reflects the characteristics of the liability cash flows.
- The projections may be performed on individual policy data; however, since the portfolio is large and we may only be looking for an approximate number, the company may instead decide to use data grouped into model points.
- The same consideration applies to the choice of projection period frequency, e.g. whether to use monthly or annual cashflows.
- Given the deterministic nature of the benefits (no embedded options or significant non-linearities), a deterministic projection is likely sufficient.

- An alternative approach would be for the company to use a stochastic model, introducing variability into any or all of the investment return, inflation, mortality or claim inception/rehabilitation/termination assumptions.

ii Determining assumptions:

- Assumptions will be required for active lives (lapses, mortality, and claim inception), and disabled lives (claim termination including death and recovery / return to work), expenses, inflation (for premium, benefit, and expense inflation) and risk-free discount rates (since this is a market consistent valuation).
- Generally, assumptions would be expected to be best estimate rather than prudent.
 - Specific allowances for risk may however be appropriate to reflect uncertainty in the cashflows to the extent that if these liabilities or cashflows were to be traded in an open market then potential purchasers might require a margin to reflect the risk that lapse, mortality, rehabilitation and expense assumptions may prove to be incorrect.
- There is unlikely to be a highly liquid active market for mortality, claim inception, claim termination, or lapse risk, so it may not be possible to determine objective market consistent assumptions for non-economic assumptions.

Mortality

- The mortality assumption is likely to be set by reference to industry statistics, internal experience investigations and information from reinsurers. Mortality is likely to be split by age and gender and possibly additional rating categories.
- Mortality might be differentiated between active lives and disabled lives, as the nature of many disabilities may imply higher than standard mortality.

Claim inception/rehabilitation/termination

- The claim inception/rehabilitation/termination rates could be based on current experience, information from reinsurers and any expected trends.
- Claim inception rates would likely differ by age, gender and occupation.
- Claim termination rates typically depend on the nature of the disability, age, gender, occupation, and time since claim inception.
- Adjustments are usually made to standard tables as the standard tables can be complex, and not all insurers will have sufficient data to derive complete tables from just their own experience.

Lapses

- Lapse assumptions could be based on current and expected future experience. Lapse rates will usually be set by duration in force and possibly policy size or other product characteristics.
- Reinsurers may be able to provide some industry information for lapse rates, but as lapse experience is often more company specific and related to sales, servicing, customer selection, and affordability, information from reinsurers may be less helpful than for mortality or claim inception rates.

Expenses

- The expense assumption might be determined based on the company's own experience and budgeted expenses and expected volumes (allowing for lapses and other decrements but not for new business).
 - And where available by reference to expense agreements available in the market, for example from third party administration companies, as well as from industry statistics and features specific to the company's own experience.
- Allowance is necessary for medical assessments to confirm continued disability. However, this may not apply to those disabilities that have no chance of recovery.

Discount rate

- The appropriate discount rate in order to obtain a market consistent valuation is a risk-free rate. Alternatively returns on index linked gilts may be used for a real risk-free rate.
 - These yields are likely to vary by term. A yield curve should be used.
- The country in which this company operates is highly developed, which suggests that its government fixed interest bond issues might be close to credit-risk free.
- It might be necessary to make adjustments if there are specific market issues such as supply and demand mismatches, although these adjustments must be made only in very specific circumstances.

Expense inflation

- Expense inflation can be estimated by considering market implied break-even inflation the difference between nominal risk-free yields and real (or inflation linked) risk-free yields.
- However, it may be appropriate to adjust these yields if expense inflation is expected to differ from the index inflation.
- The expense inflation assumption must reflect those for a closed book, which may rise faster than inflation due to reducing economies of scale.
- Alternatively, the real expense cashflows could be valued directly by discounting at a real risk-free curve.

Tax and investment expenses

- Any tax and investment expense assumptions necessary to calculate frictional costs should be set based on recent experience and any expected future changes.

This question was generally poorly answered.

In part (i), many candidates provided wrote bookwork rather than tailoring it to the specific question. Some candidates gave extremely theoretical definitions of replicating portfolios without any practical thought to what the model would need to do in practice.

In part (ii), candidates gave overwhelmingly too little detail on each of the assumptions required, including specific requirements for each type of assumption.

Assumptions for claim inception and claim termination rates are key for income protection policies, however several candidates either did not mention them or if they did it was as an after-

thought. Vague references to “morbidity assumptions” doesn’t demonstrate appreciation of the actual assumptions needed.

Many candidates confused “valuation rate” or “discount rate” with “risk discount rate”. This reflects a lack of understanding of market consistent ideas and misuse of the word “risk discount rate” outside of Traditional Embedded Value or pricing contexts. Several candidates referenced profit testing and profit margins even though the question had nothing to do with pricing.

Several candidates mentioned both investment returns and discount rates without explaining the link between them, or why investment return assumptions are even necessary. Many candidates wrote about asset valuations which was not what was asked for.

QUESTION 6

i. Contribution method features:

- Surplus is distributed among policies in the same proportion as those policies contributed to the surplus.
- In practice policyholders will be grouped into relatively homogeneous groups for calculating the surplus (or dividend) payable to them.
- All sources of profit (comprising mortality, expense, withdrawal and investment experience) are usually distributed under the contribution method.
- The proportion of the total surplus which is distributed will vary from year to year.
 - The amount of distributable surplus will be determined by the company, and the dividend formula will be applied with respect to this surplus.
- The dividend could be paid out as a cash sum, used to reduce future premiums or converted into a “paid-up” addition to the benefit.
- A terminal bonus may be payable.
- There is less subjective judgement required compared to additions to benefits.

ii. Calculation of the dividend in local currency units:

$$\text{Dividend} = (V_0 + P)(i'' - i) + (q - q'')(SA - V_1) + [E(1+i) - E''(1+i'')]$$

where '' denotes actual items of experience

$$\begin{aligned} \text{Dividend} &= (50\,000 + 2\,000)(0.07 - 0.05) + (0.005 - 0.01)(100\,000 - 60\,000) \\ &\quad + [200(1.05) - 100(1.07)] \end{aligned}$$

$$\text{i.e. Dividend} = 1040 - 200 + 103 = 943 \text{ local currency units}$$

iii. Actual dividend may differ due to:

- The dividend may be smoothed to reflect policyholder reasonable expectations and to avoid adverse reaction to low dividends.
- The dividend may be adjusted to be consistent with competitors.
- The company could decide to hold back some profit:
 - To be able to pay a terminal bonus.

- To strengthen financial solvency in order to provide a buffer against future adverse experience and also to enable greater investment freedom for maximising future investment returns and bonuses.
- The dividend formula may exclude items of profit not distributable to policyholders, e.g. some profit margins in the premium or withdrawal experience profit.
- The dividend formula may not accurately reflect timing of cashflows, e.g. the actual timing of premiums, expenses or death payments may differ from that assumed in the dividend formula.
- There may be differences between the sum of individual components of the dividend formula and the corresponding aggregate items, e.g.:
 - Actual total death claims may differ from the aggregate of $SA.q$ due to the method used for calculating q for a small group of policyholders;
 - Actual total expenses may differ from the aggregate of E due to the method of determining actual expenses incurred by small groups;
 - Actual total investment returns may differ from the aggregate of $(V_0+P).i$ due to the method of determining actual returns for small groups.

Overall performance was disappointing and reflected poor bookwork knowledge.

Part (i) was bookwork yet very few candidates scored highly.

Part (ii) was a very simple application question and required candidates to know the bookwork formula, which only a few did.

Most candidates were able to generate some valid points for part (iii). Almost no-one considered the impact of withdrawal experience as a source of profit.

QUESTION 7

i. Liability characteristics and suitable backing assets:

- The level annuities are fixed in nature.
 - Suitable assets are therefore fixed-interest or zero coupon bonds, ideally risk-free.
 - Fixed-interest corporate bonds might be suitable if the company is willing to accept the credit risk for the higher return.
- The inflation-linked annuities are real in nature.
 - Suitable assets are inflation-linked bonds, ideally risk free.
 - If inflation linkage for annuities is higher from that available on inflation-linked bonds, or bonds are not available, the insurer might consider real assets such as equities and property.
 - However, equities and property do not offer guaranteed linkage to inflation and volatile values could increase the insolvency risk for the insurer.
- Insurer's expenses are largely IT and wages, hence real in nature.
 - If wage inflation exceeds CPI, the insurer may need equity and property assets.

- Or, if expense inflation is closer to CPI, then inflation-linked bonds can be used.
- Annuity terms could be very long, requiring bonds of similar duration to be matched (if available).
- Liabilities are likely to be local currency, requiring assets of the same currency to be matched.
 - If sufficient and appropriate local assets are not available, then foreign assets may be considered along with appropriate currency hedging.
- Short term outgo requires liquid assets and cash is most appropriate.

ii. Reasons for losses and experience items:

- For each of the last two years the insurer may have had one-off losses relating to this particular book, e.g.:
 - One-off expenses (such as new IT system), or
 - Counterparty defaults (such as reinsurers, or assets held).
- For each of the last two years the insurer has made adverse method (modelling) and/or basis (assumption) changes to its valuation for this book.
- There may be errors in the underlying data used for either the assumption setting or the valuation and AOS,
- There may have been errors in any of the steps or methods in performing the experience investigations, the valuation or the AoS.
- The best estimate basis could have been inaccurate for other reasons (such as poor judgement).
- Investment losses will arise if the book is mismatched and the market moves against the insurer, eg:
 - Mismatched by duration; or currency if holding foreign assets without currency hedges; or credit spreads moved against the insurer if holding corporate bonds.
- For new business sold in each year, profits/losses arise if there are differences between the pricing basis and valuation basis (i.e. best estimate) for new business sold.
 - An outdated or incorrect pricing basis may result in losses if the (best-estimate) valuation basis reflects a deterioration in experience from that assumed in the pricing assumptions.
 - Expenses assumed in the pricing basis might be lower than those allowed for in the valuation basis.
 - E.g. if fewer policies than expected were sold it would lead to higher fixed initial expenses per policy in the valuation compared to pricing.
 - The valuation expense inflation outlook and assumption could have worsened from when pricing was done.
 - If the valuation mortality rate is lower than assumed in the pricing basis, this could contribute to lower profitability for new business.
 - Allowance for mortality improvements may have changed from when pricing was done.
 - Mix of business was different to expected and there are cross-subsidies in the pricing.

- For existing business profits/losses arise due to differences between actual experience and the valuation basis (i.e. best estimate), similar to above.
- If the level annuity book is small it is likely that experience could be more volatile than for a larger annuity book. That is, the losses are just random fluctuations (particularly if small losses).

Most candidates did very well on part (i).

The answers to part (ii) were generally poor and most candidates struggled to give appropriate answers or a sufficient variety of answers. Some answers were too generic and not tailored to the specific situation. Very few candidates appreciated that investment losses arise only where there is a mismatched position and the market moves against the insurer. A large number referred to withdrawals or similar, which is not possible for standard annuities in payment like these. A significant number referred to new business strain as if this was automatic. However, this only arises for single premium business if the pricing basis is more aggressive than the valuation basis.

QUESTION 8

i. Advantages for the policyholder:

- Benefits are available on death/surrender/maturity.
 - Although these are not expected to be significant, they would not be available at all on conventional policies.
- Pricing should be more competitive than with conventional business.
 - Fewer margins need to be included when pricing due to the fact that risk charges and premiums are not guaranteed.
- If the insurer's morbidity experience is better than expected charges should be reduced.
 - This would result in higher unit-related benefits than expected (i.e. death, surrender and maturity benefits).
 - Alternatively, premiums may be reduced at policy reviews.
- There could be some flexibility to vary premium or benefit levels under in-force policies.
 - This could include increasing the risk benefit (subject to underwriting).
- The product could easily be changed by including elements to meet other needs.
 - E.g. by adding an increased guaranteed minimum death benefit.

Disadvantages for the policyholder:

- If the insurer's morbidity experience is poorer than expected the risk charges may be increased.
 - This would result in lower unit-related benefits than expected (i.e. death, surrender and maturity benefits).
 - This would also put upward pressure on premiums at the 5-yearly premium reviews.

- Investments may perform worse than anticipated (in the only unit fund offered).
 - This would result in lower death, surrender and maturity benefits than expected.
- If policyholders wanted to increase their risk benefit in the future the unit-linked structure could deal with this, but the additional cover would need to be underwritten, and so there is no guarantee it would be available on suitable terms (if at all) dependent on the policyholder's state of health. .
- The contract may be difficult for policyholders to understand.
 - E.g. the variability of charges, or why certain benefits are unit-linked and not others.
- Similar difficulties may be encountered by the salesforce, which could result in poor advice being received by policyholders.

ii. Risk Premium reinsurance:

- This could be based on sum assured (i.e. the regular income protection benefit payments) or sum at risk, the former being more likely due to its simplicity for term protection policies (together with the difficulty of finding a suitable definition of sum at risk for these policies – as the risk benefit is not a lump sum).
- The portion of the sum assured (income protection annuity benefit) reinsured can be determined as:
 - A fixed percentage of the income protection benefit, known as quota share (or reducing retention method); or
 - All of the income protection benefit above an agreed retention, known as individual surplus (or constant retention method).
- The arrangement is likely to have low retention limits initially due to the company's lack of experience.
- This will assist in reducing claim fluctuations.
 - This is likely to be a concern for a recently established company.
- To benefit from the reinsurer's technical assistance, which is of particular benefit here as the company is new to the market, and could include the following related to the claims risk:
 - access to rating data and advice
 - advice on initial and claims underwriting

Individual Risk XL:

- Could be used to protect against individual claims of long duration
- Policies which would require large monthly payouts would be better dealt with using surplus reinsurance.

Catastrophe (Aggregate) XL:

- Can reduce aggregations of claims caused by non-independence of risks
- E.g. if the insurer faces a number of claims from policyholders who are all employed in the same industry where they are exposed to a harmful substance or a global pandemic.

- While not as significant a concern as it would have been for group business, it is nevertheless of relevance.

Stop Loss:

- Can protect against overall experience on the business being worse than a specified level.
- This is a potential problem as the insurer is new to the market and will thus not have much experience or data for pricing
- Such cover, however, may not be readily available

Overall, this question was very poorly answered, often highlighting gaps in candidates' knowledge and/or poor exam technique including a failure to read the question carefully.

In part (i) many candidates did not answer the question, simply describing what the product offered rather than describing its advantages and disadvantages relative to a conventional product as was required. Such answers scored very few marks. The unit-linked and conventional products are similar in many ways, but these were not the things candidates were expected to describe. Many candidates also wasted time speculating on general policy conditions (which were not given in the question).

Many candidates failed to appreciate that conventional individual IP policies would often have risk benefits expressed in monetary terms rather than as a percentage of salary (although may have a cap expressed as a replacement ratio) and need not have guaranteed increases (be they fixed or linked to an index). Where premiums are not guaranteed, a 5-yearly review is not uncommon. They do not generally offer surrender or maturity benefits and do not cover redundancy. They commonly provide a premium waiver benefit.

In part (ii) a significant number of candidates suggested reinsurance on original terms (coinsurance) for this unit-linked product, which is inappropriate. The insurer does not need cover for the death/surrender/maturity benefits, nor would a reinsurer wish to provide this unit-related benefit. Most candidates mentioned quota share and individual surplus as options, but many did not indicate that this would be under a risk premium structure as opposed to original terms and so did not gain credit. A number of candidates discussed financial reinsurance, which is not aimed at protecting against claims risk.

END OF EXAMINERS' REPORT